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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,031	01/29/2004	Masayuki Hata	57810-085	1109

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EXAMINER	
RICHARDS, N DREW	
ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 06/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/766,031	HATA ET AL.	
	Examiner	Art Unit	
	N. Drew Richards	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) *27-29* is/are withdrawn from consideration.

5)☒ Claim(s) *18-20 and 24-26* is/are allowed.

6)☒ Claim(s) *1-17 and 21* is/are rejected.

7)☒ Claim(s) *22 and 23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/11/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1-26 in the reply filed on 2/23/05 is acknowledged. Claims 27-29 are withdrawn from consideration as being drawn towards a nonelected invention.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-13,15-17 and 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Takatani et al. (U.S. Patent No. 6,812,496 B2).

With regard to claim 1, Takatani et al. disclose in figure 5, a device comprising:

- a substrate 100 provided with a region of the back surface having concentrated dislocations X1 at least on part of the back surface thereof;
- a semiconductor element layer (layers above 100 and below 116) formed on the front surface of the substrate 100;
- an insulator layer 115 (unlabeled in figure 5, see figure 4 for label) formed on the region of the back surface having concentrated dislocations X1;

- a back electrode 117 formed to be in contact with a region of the back surface of the substrate other than the region of the back surface having concentrated dislocations X1.

With regard to claim 2, Takatani further disclose:

- the semiconductor element layer is provided with a region of the front surface having concentrated dislocations X1 at least on a part of the front surface;
- the semiconductor device further comprising a front electrode 116 formed to be in contact with a region of the front surface of the semiconductor element layer other than the region of the concentrated dislocations X1.

With regard to claim 3, the substrate is a nitride-based semiconductor substrate.

With regard to claim 4, Takatani et al. disclose in figures 5 or 12:

- a semiconductor element layer (layers above 100 and below 116) formed on the front surface of the substrate 100 and provided with a region of the front surface having concentrated dislocations X1 at least on a part of the front surface;
- an insulator film (115 in figure 5 or 122 in figure 12) formed on the region of concentrated dislocations X1;
- a front electrode 116 formed to be in contact with a region of the front surface of the element layer other than the region having the concentrated dislocations.

With regard to claim 5, the substrate has concentrated dislocations X1 on the back surface thereof and a back electrode 117 in contact with the back surface in a region other than the region where the concentrated dislocations are formed.

With regard to claim 6, the substrate is a nitride-based semiconductor substrate.

With regard to claim 7, as seen in figure 12 the back electrode is provided inwardly spaced from the side of the substrate by a prescribed interval.

With regard to claim 8, as seen in figure 5, an insulator film 15 is formed on the back surface on the region of the concentrated dislocations.

With regard to claim 9, Takatani et al. disclose in figure 5:

- a semiconductor element layer 109 (and unlabeled central layers formed on 109, these layers are labeled 110 and 111 in figure 1) formed on the front surface of a substrate 100 and provided with a region of concentrated dislocations X1 on part of the front surface;
- a recess portion (filled with 112, layer 109 is recessed on the sides) formed on a region of the front surface of the element layer 109 located inward beyond the region of the concentrated dislocations X1 (the recess extends inwards past dislocations X1); and
- a front electrode 116 formed to be in contact with a region of the element layer other than the region of the concentrated dislocations X1.

With regard to claim 10, the substrate has concentrated dislocations X1 on the back surface thereof and a back electrode 117 in contact with the back surface in a region other than the region where the concentrated dislocations are formed.

With regard to claim 11, as seen in figure 5, an insulator film 15 is formed on the back surface on the region of the concentrated dislocations.

With regard to claim 12, the substrate is a nitride-based semiconductor substrate.

With regard to claim 13, Takatani et al. disclose in figure 5:

- a semiconductor element layer 109 (and unlabeled central layers above) formed on the front surface of a substrate 100 and provided with a region of the front surface having concentrated dislocations X1 at least on part of the front surface;
- a high resistance region X1 formed in the region of the concentrated dislocations (the region of concentrated dislocations inherently has a higher resistance, any higher resistance is considered a "high" resistance);
- a front electrode 116 formed to be in contact with a region of the element layer other than the region of the concentrated dislocations X1.

With regard to claim 15, the substrate has concentrated dislocations X1 on the back surface thereof and a back electrode 117 in contact with the back surface in a region other than the region where the concentrated dislocations are formed.

With regard to claim 16, as seen in figure 5, an insulator film 15 is formed on the back surface on the region of the concentrated dislocations.

With regard to claim 17, the substrate is a nitride-based semiconductor substrate.

With regard to claim 21, Takatani et al. disclose in figure 5:

- a substrate (layers 100-109) including a first region having a first thickness (central portion where 109 is thicker) and a second region provided with a region of concentrated dislocations X1 on the front surface thereof while having a second thickness smaller than the first thickness (the edge portions have a smaller thickness);
- a semiconductor element layer (110 and 111 above 109 in the central region, for labels see figure 1) formed on the first region of the front surface of the substrate other than the second region; and
- a front electrode 116 formed to be in contact with the front surface of the element layer (110 and 111).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takatani et al. as applied to claims 1-13, 15-17 and 21 above, and further in view of Wilmsen et al. (Vertical-Cavity Surface-Emitting Lasers, Pp. 4 and 7).

Takatani et al. do not teach the high resistance region including an impurity introduction layer formed by introducing an impurity. Wilmsen et al. teach various lasers structures in figure 1.4. Specifically in figure 1.4(b) Wilmsen teach a high resistance region on either side of a central semiconductor element layer so as to confine the current in the semiconductor element layer to a smaller central area. Wilmsen teach the high resistance region being proton doped which reads on an impurity introduction layer. At the time of the invention, it would have been obvious to one of ordinary skill in the art to form the proton doped regions of Wilmsen et al. in the laser device of Takatani et al. in order to confine the current to allow for the formation of a VCSEL.

Allowable Subject Matter

6. Claims 18-20 and 24-26 are allowed.

7. Claims 22 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: Prior art of record fails to teach, disclose, or suggest, either alone or in combination, the invention of claims 18-20, 22, 23, or 24-26. Specifically, the prior art fails to teach:

- The device of claim 18 where the upper surface having the concentrated dislocations is partially removed and located downward beyond the active layer;
- The device of claim 22 where the semiconductor element layer as claimed claim 21 includes the active layer;
- The device of claim 24 wherein a first selective growth mask is formed inward beyond the concentrated dislocations and having a width smaller than a width of the region of the concentrated dislocations.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Dutta et al. (U.S. Patent No. 5861636), Yamaguchi et al. (U.S. Patent No. 6855959 B2), Takeya et al. (U.S. Patent No. 6509579 B2), Ikeda (U.S. Patent No. 6111277), Motoki et al. (US Pub. No. 2003/0145783 A1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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